इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 13055 (1991): Methods of sampling and test for anaerobic adhesives and sealants [PCD 12: Plastics]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS 13055 : 1991

भारतीय मानक

एनरोबिक आसंजक और मुहरबन्दी सामग्री के नमूने लेने और परीक्षण की पद्धतियाँ

Indian Standard

METHODS OF SAMPLING AND TEST FOR ANAEROBIC ADHESIVES AND SEALANTS

UDC 665 939 5 : 620 113

© BIS 1991

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1991

Price Group 5

Adhesives Sectional Committee, PCD 15

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Adhesives Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Anaerobic adhesives are single component materials, namely, acrylic monomers that harden to a polymeric solid in the absence of air or oxygen. Adhesive functions on the principle of free radical chain mechanism. Oxygen being scavenger of the free radical mechanism inhibits polymerisation. Therefore, free air space is provided in the adhesive containers to keep the adhesive in liquid form. Contact with active metal parts or elevated temperatures accelerate the cure speed.

Anaerobic adhesives are mainly used for locking, sealing and retaining metal parts and find extensive use in automobile industry, railways and other industries where permanent or semi-permanent joints are required. Details of intended uses and general instructions have been covered under Annex A of this standard.

This standard, for methods of sampling and test for anaerobic adhesives, covers tests for determination of viscosity, consistency, wettability, corrosivity, storage stability, breakaway torque, static shear strength, sealing capability, handling cure, and locking torque.

In formulation of this standard, considerable assistance has been derived from the following *international standards*:

1.	MIL-S-46163	Test method for breakaway strength
2	MIL-R-46082A-1968	Test method for static shear strength
3	MIL-S-22473D	Test method for prevailing strength
4	DIN-54452-1981	Testing of adhesives for metals and adhesive bonded metal joints *'compression shear test'*
5	DIN-54453-1982	Testing of adhesives for metals and bonded metal joints 'Dynamic viscosity' Determination of anaerobic adhesives by rotation viscometer
6	DIN-54454-1977	Testing of adhesives for metals of bonded metal joints, initial break-away test on bonded screw threads
7.	JIS-K 6820-1977	Standard for testing sealents
8	BS 5350 (Part 1) : 1987	Methods of test for anaerobics Determination of torque strength on a threaded fastener
9.	BS 5350 (Part 2) : 1987	Determination of static shear strength
10.	BS 5350 (Part 3) : 1987	Determination of ability of anaerobic adhesives to set on metal surfaces
11	NF: T76-121-1987	Structural adhesives — Determination of pin and collar type assembly shear strength
12	ISO/DIS/10123	Adhesives — Determination of shear strength of anaerobic adhesives using pin and collar specimens

AMENDMENT NO. 1 JANUARY 1994
TO
IS 13055 : 1991 METHODS OF SAMPLING AND TEST FOR ANAEROBIC ADHESIVES AND SEALANTS

(*Clause* **14.1.1**, *line* 5) — Read $\begin{matrix}+\ 006\\+\ 017\\12\ \ 500\text{ mm}\end{matrix}$ in place of $\begin{matrix}+\ 006\\+\ 017\\12\ \ 000\text{ mm}\end{matrix}$

(*Clause* **15.2**, *line* 1) — Read 'Fig 4' *for* 'Fig 3'

(*Clause* **15.2**, *line* 8, clause **15.3.1**, *para* 1, *line* 5 *and para* 2, *line* 6) – Read 'Kg metre' for 'Newton metre'

(*Clause* **15.3.1**, *para* 3, *line* 3) — Read '10 kg/cm^2 (1MPa)' in place of '10 MPa'.

(*Clause* **15.3.1**, *para* 4, *line* 4) — Read 'kg/cm^2 (40 MPa)' in place of '400 MPa'

(*Clause* **15.4**, *line* 17) — Read '1 MPa' in place of '10 MPa'

(PCD 15)

Reprography Unit BIS, New Delhi, India

Indian Standard

METHODS OF SAMPLING AND TEST FOR ANAEROBIC ADHESIVES AND SEALANTS

1 SCOPE

1.1 This standard prescribes methods of sampling and tests for single component anaerobic adhesives and sealant compounds suitable for locking, sealing and retaining metal parts. The compounds are normally liquid and are converted to *insoluble thermoset state* when confined between closely fitting metal surfaces in the absence of air.

2 REFERENCES

2.1 List of Indian Standards which are necessary adjuncts to this standard is given in Annex B.

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Anaerobic Adhesive

A compound that hardens to a polymeric solid in the absence of air (oxygen), curing being inhibited by the presence of oxygen and catalysed by metal ions

NOTE — *Curing in the containers is prevented for a* specific period of time, by the presence of air above the liquid and permeability of air through container walls

3.2 Break-away Torque (BAT)

Measurement with fasteners of the force required to initiate movement of an unseated fastener in a loosening direction. In other words, it is the force necessary to rotate a nut on a bolt, the engaged threads of which are filled with the cured compound.

3.3 Break Loose (Unseating) Torque

Maximum initial value of the force observed when a clamped or seated fastener is being loosened.

3.4 Handling Cure

Time taken by the compound to set initially. Alternatively, the minimum time required after application of the compound for the parts to be handled for consequent assembly operation.

NOTE — This term is not synonymous with functional cure/full cure time which shall be as agreed to between the manufacturer and the buyer.

3.5 Locking Torque

Locking torque in a fastened joint is a turning or twisting force required to produce a rotation about an axis.

3.6 Primer

A compound capable of hastening the curing process, without the aid of heating or any other external parameters, also sometimes called as 'Activator'.

3.7 Prevailing Torque (PT)

The average force (torque) needed to provide continuing movement to the nut after unseating through one full turn, namely, after measuring breakaway torque.

3.8 Retaining

Bonding of cylindrical parts such as a gear on to a shaft or bearing on to a shaft or housing.

3.9 Sealant

A sealant is an adhesive generally used for sealing threaded joints, gasket joints, bearings, etc, to prevent leakage and loosening of joints due to vibrations.

NOTE — Sealing of threaded joints is generally achieved by making the male and female parts of close tolerances or use of PTFE tapes to fill up the gaps. Use of anaerobic sealants eliminates the need for tapes or close tolerances and fouling due to tape shredding, etc In addition, they prevent loosening due to vibration In gasket joints the mating flanges are *machined and a specific type of gasket is used to* prevent leaks

3.10 Static Shear Strength

The force required to rupture co-axial joint by a force applied along the axis

4 QUALITY OF REAGENTS

4.1 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070 : 1977) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis

5 SAMPLING

5.1 Scale of Sampling

5.1.1 *Lot*

All the containers in a single consignment of the material of the same type, same grade and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

5.1.2 The number of containers to be sampled from the lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 1.

Table 1 Scale of Sampling

No. of Containers in the Lot	Sample Size
(1)	(2)
Up to 5	2
6 to 15	3
16 to 25	4
26 to 50	5
51 and above	6

5.1.3 The containers shall be selected at random. In order to ensure the randomness of selection, procedures given in IS 4905 : 1968 may be followed.

5.2 Number of Tests and Criteria for Conformity

5.2.1 From each of the containers selected according to **5.1.2** from the lot, a representative quantity of material, sufficient for carrying out all the tests given in this standard, shall be taken which constitutes the individual test sample

5.2.2 The individual test sample shall be subjected to all the tests prescribed in the individual product standard

5.2.3 The lot shall be declared as conforming to the requirements of the relevant material specification, if all the test results on each of the individual samples meet the corresponding specification requirements

6 PACKING AND MARKING

6.1 Packing

a) The material shall be packed in 5 ml to 250 ml packing size;

b) The containers should be leakproof with a suitable cap. If desired by the user, the cap may be shaped in the form of nozzle for easy application;

c) The containers should be made up of LDPE or any other suitable plastic and preferably coloured to minimize UV radiation entry in the compound; and

d) The filled containers should be packed in wooden crates/cartons to avoid damage in transit.

6.2 Marking

6.2.1 Each container shall be legibly and indelibly marked with the following:

a) Name of the material;

b) Indication of source of manufacture;

c) Month and year of manufacture;

d) Complete instructions for application and use; and

e) Storage instructions and cautions; if any.

The material shall also be marked with the Standard Mark.

7 DETERMINATION OF VISCOSITY

7.0 General

Information on viscosity is usually required to ensure that the adhesive has correct flow characteristic for use. Viscosity of the anaerobic adhesive is determined by Brookfield Viscometer. When the viscosity of thixotropic adhesive is measured, at least two measurements shall be taken at two different speeds

7.1 Apparatus

Brookfield Viscometer

7.2 Procedure

Fill the compound in a 250 ml beaker taking care that it remains free from air bubbles. With the use of a viscometer such as Brookfield RVT model, determine viscosity of the material using Spindles No. 2 and 4 for liquids and T-spindles for pastes. Other viscometers may also be used provided they have been calibrated against Brookfield Viscometer The temperature of the laboratory should be maintained at 27±2°C. A minimum of 10 readings shall be taken within 15 minutes and at a fixed speed of 20 rev/min (RPM) on the viscometer The average of these 10 readings shall be taken as the viscosity of the compound. The viscosity shall be reported in mPas.

8 DETERMINATION OF CONSISTENCY

8.1 Procedure

Place one millilitre of the compound in 10 ml solution of trichloroethylene containing 5 percent by volume of acetone After shaking the mix thoroughly, examine the solution under transmitted light. The solution shall be smooth, homogeneous and free from lumps and caked material

9 DETERMINATION OF WETTABILITY

9.1 Procedure

Clean the sheets of steel, aluminium and brass by buffing with number 400 emery cloth. Wash in 1.1.1 trichloroethane at least three times to degrease them using a fresh portion of solvent each time and allow them to dry (*see* Note below) Apply a few drops of the compound (approximately 0'03 ml) to the prepared surfaces of each of the metals. The compound shall be considered wettable if there is a clear evidence of the migration of the compound to cover an area greater than that initially wetted by the drops.

NOTE — Other more thorough methods of degreasing with another solvent may be used but are not essential to the method. Any solvent used should not leave any residue on the surface that is detectable on visual inspection.

10 CORROSION RESISTANCE

10.1 Procedure

Prepare specimens of steel, aluminium and brass as specified in **9.1** and partially coat with the compound by brush. The specimen shall then be allowed to stand for 10 days at temperature of 27±2°C. The compound shall be removed by wiping with a non-abrasive cloth, wet with water or 1.1.1 trichloroethane and then examine the surface. Any permanent discoloration in film form on the metals which does not buff with the non-abrasive cloth shall be considered as evidence of corrosion.

11 MEASUREMENT OF LOCKING TORQUE

11.0 General

This test method covers determination of the locking torque by the use of nut and bolt specimens under defined conditions of preparation, conditioning and testing.

11.1 Locking Torque at Standard Atmospheric Conditions

11.1.1 *Preparation of Specimens*

The threaded fasteners used in the tests shall be M10 × 1·5 pitch non-oxidised steel bolts and nuts as per IS 1364 (Part 1) : 1983. The bolts shall be 25 mm long and have hexagonal heads and may be finished or unfinished. The nuts shall be M10 size as per IS 1364 (Part 3) : 1983 heavy, finished or unfinished. All bolts used in one series of tests shall be taken from one lot. Degrease bolts and nuts with 1.1.1 trichloroethane (*see* **9.1**), store in a clean atmosphere at a temperature of 27±2°C and relative humidity (65±5 percent). Examine the bolts and nuts for damaged threads and any such damaged bolts or nuts shall not be used for these tests.

One nut shall be screwed into each bolt and moved back and forth with fingers, care being taken to avoid finger prints on the threads. Bolt-nut pair showing excessively tight or excessively loose fits or sticking due to burrs shall be rejected. However, no effort shall be made to select pairs having matched clearances and the threads shall not be cleaned with file, tap or die. The assemblies shall be stored until such time for the application of the compound with the nuts screwed on until 12 to 15 mm of the threaded end of the bolt protrudes. The assemblies shall be selected at random for the various tests.

11.1.2 *Procedure*

To start the test, sufficient compound shall be applied by means of a glass rod or direct from the container nozzle to cover completely the protruding threads of the bolt. The nut shall be unscrewed over the compound until the end of the nut is flush with the end of the bolt (full nut engagement) and then screwed back on the bolt until 8 to 10 mm of the bolt protrudes, to ensure complete coverage of the compound in the engaged area and absence of air gaps.

11.1.2.1 The bolts and nuts coated with the compound as per **11.1.2** shall be allowed to cure at a temperature of 27±2°C for 24 hours. Thereafter, clamp the bolts on a vice. Unscrew the nut from the bolt with a calibrated torque wrench (range 0·4 kg metre to 5·0 kg metre having 0·1 kg metre sensitivity). Record the break away torque (BAT) at a point when the nut just starts moving. After reading BAT, four more readings at ¼, ½, ¾ and 1 full turn are noted. The average of these four readings is recorded as Prevailing Torque.

11.1.3 *Report*

To arrive at the Torque value, a set of 10 bolts and nuts shall be used and Break away torque and Prevailing torque values recorded. The averages of these 10 readings is reported as Breakaway torque and Prevailing torque. The values are recorded in Newton metre.

11.2 Locking Torque After Immersion in Chemicals/Chemical Resistance

11.2.1 The bolt and nut assemblies coated with the compound in accordance with **11.1.2** shall be allowed to age in air at 27 ± 2°C for 24 hours. After ageing, 5 specimens shall be immersed for 168 hours at 85 ± 3°C in each of the test liquid/chemical specified in the product specification. For certain applications, a higher/lower temperature and longer/shorter duration of immersion in a specific test liquid may be required, the same would be specified in individual product standard. Some of the typical test chemicals are indicated below:

a) Distilled water (*see* IS 1070 : 1977)

b) Sea water (*see* IS 9770 : 1978)

c) Toluene (*see* IS 1839 : 1961)

d) Lubricating oil — SAE 40 (*see* IS 4578 : 1968)

e) Transformer oil (*see* IS 335 : 1983)

f) Diesel (*see* IS 1460 : 1974)

g) Ethylene glycol (*see* IS 5295 : 1969)

h) Petrol, leaded or unleaded

j) Butyl alcohol (*see* IS 361 : 1973)

k) Acetone

Immediately upon removal of the test specimens from the test liquids, locking torque shall be determined as per **11.1.2.1** without curing.

11.3 Locking Torque at Elevated Temperature/Hot Strength

11.3.1 Specimens shall be prepared as specified in **11.1.1** and **11.1.2**, except that after 24 hours of curing at 27 ± 2°C, the specimens shall be heated to 150 ± 3°C in an oven for 2 hours. The locking torque shall be measured within 30 seconds after removal of the assembly from the oven.

11.4 Locking Torque After Heat Ageing

11.4.1 Bolt and nut assemblies shall be prepared as specified in **11.3** except that after 24 hours curing the assemblies shall be placed in an oven set at 150 ± 3°C for 1 000 hours. The specimens shall then be cooled to laboratory temperature for an hour and locking torque determined. At least 10 sets of bolt and nut assemblies shall be used for this test.

11.5 Locking Torque at Low Temperature

11.5.1 Bolt and nut assemblies shall be prepared as specified in **11.1.1** and **11.1.2** except that after 24 hours curing the assemblies shall be placed in a container having a temperature of −50°C and conditioned at this temperature for 2 hours. The specimens shall then be taken out of the container and tested within 30 seconds for locking torque.

12 STORAGE STABILITY

12.1 Procedure

Condition one bottle of each size of the container from a batch, for 10 days at 49 ± 2°C. After cooling to room temperature, the compound shall be tested for viscosity as per **7.0** and locking torque, after normal curing, as per **11.1** An increase in viscosity in excess of 50 percent or failure of the compound to meet the minimum locking torque values shall constitute excessive deterioration.

13 HANDLING CURE

13.1 Procedure

The adhesive used shall be capable of curing between metal surfaces. This is determined by examining one of the bolt and nut applied with adhesive as specified in **11.1.2** by placing the bolt/nut between the thumb and index finger and attempting to loosen it after the lapse of handling cure time specified by the manufacturer or specified in the individual product standard. If the nut does not slip loose, the time taken in minutes from the time of applying the compound is recorded. The bond between a test piece of bolt and nut shall be tested once only. Once tested, adherends shall not be re-used as the disturbance of the bolt during checking may retard the cure. Care should be taken not to recheck the same bolt from a set more than once since the disturbance of the bolt during checking may retard the cure.

14 STATIC SHEAR STRENGTH

14.0 General

This test method covers determination of static shear strength by the use of pin and bush or collar specimens under defined conditions of preparation, conditioning and testing. The adhesive under test is used to lock a specified bush or collar and pin together. The force required to rupture the coaxial joint is then measured. The increasing force is applied by a tensile testing machine which can operate at a constant cross head speed.

14.1 Static Shear Strength at Standard Atmospheric Conditions

14.1.1 *Preparation of Specimen*

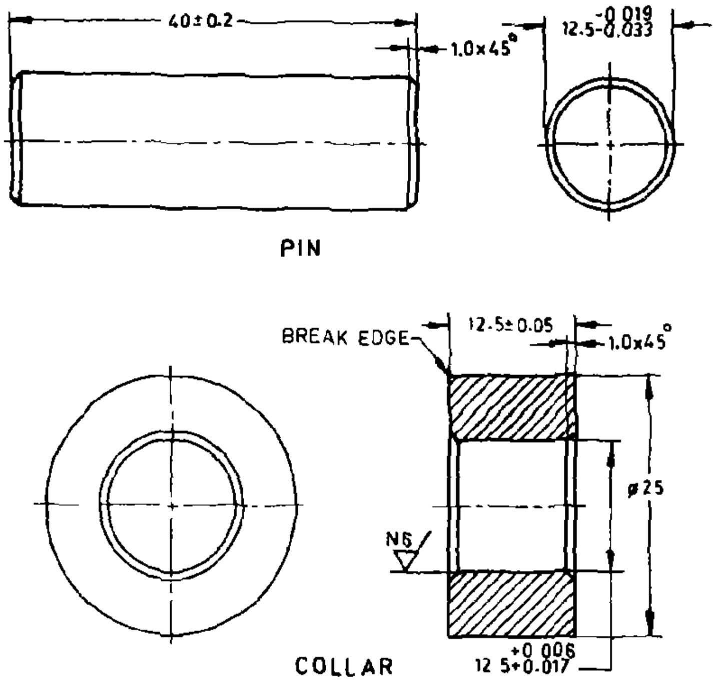
Six sets of specimen consisting of a pin and bush or collar made out of low carbon mild steel conforming to IS 226 · 1975 shall be taken for test. The pin shall be of $12\,500^{-0\,019}_{-0\,033}$ mm outer diameter and the collar shall be of $12\,000^{+006}_{+017}$ mm inner diameter with a surface finish of Rz 6 to 10 μm. Each pair of pin and collar shall be so matched that the diametrical clearance is 0·025 to 0 050 mm The collar may be 12·5 ± 0 05 mm, in height, with chamfer of 1 0 × 45 on one side of the bore The pin may be assembled into collar from chamfer end. Similar chamfer may be provided on both sides of the pin Pin length may be 40 ± 0 2 mm.

The matched pairs of pin and collar shall be identified with punch marking so that they do not get interchanged during degreasing. Degrease pin and collar specimen with 1 1.1 trichloroethane (*see* **9.1**) and store at a temperature of 27 ± 2°C and relative humidity of 65 ± 5 percent.

14.1.2 *Procedure*

Adequate compound is applied to the pin to cover the internal surface of the bush. The bush is then slipped onto the pin and moved back and forth to adequately spread the compound between the pin and bush. The pin and bush are then allowed to cure with the bush standing on its side (*See* Fig. 1, for dimensions of pin and collar and Fig. 2 for assembly for static shear strength).

14.1.2.1 After the pin and bush have been allowed to cure for 24 hours at a temperature of 27 ± 2°C, the static shear strength is determined by placing the assembly on a hollow support cylinder so that the bush rests on the upper end of the cylinder and the lower end of the pin is received within the hollow portion of the cylinder. The hollow support cylinder and the pin and bush assembly are then positioned on a platen of a tensile testing machine. The machine is then so adjusted that the upper end of the pin is just below the fixed plate of the tester (*see* Fig. 2). The machine is switched on, loading the pin at a constant speed of 0·025 mm per second until the bond breaks. The load at which the bond breaks is recorded in newtons and shear strength computed by dividing this force by the bonded area expressed in mm² between the pin and bush. The average of the six readings is recorded as Static Shear Strength. The unit of measurement for recording is MPa.



All dimensions in millimetres.

FIG. 1 PIN AND COLLAR

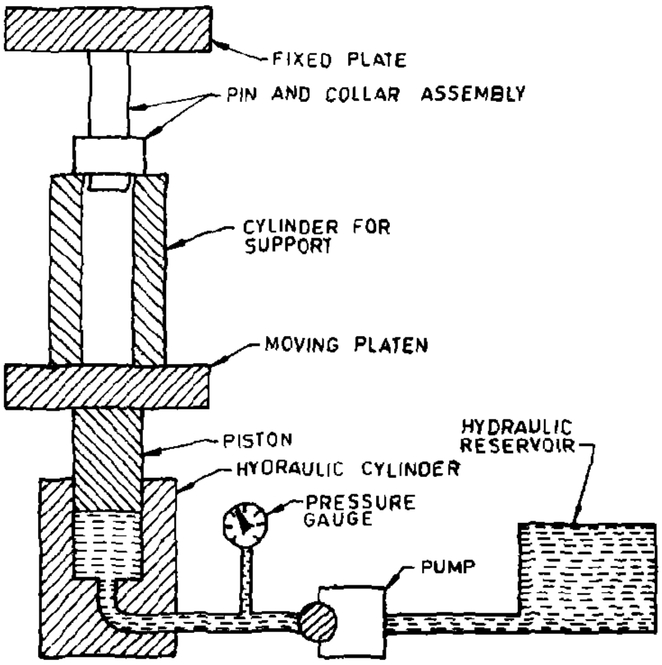


FIG. 2 ASSEMBLY FOR STATIC SHEAR STRENGTH TEST

14.2 Shear Strength After Immersion in Chemicals/Chemical Resistance

14.2.1 The pin and bush assemblies shall be prepared as specified in **14.1.1** and coated with the compound in accordance with **14.1.2**, shall be allowed to cure at 27 ± 2°C for 24 hours. After ageing, 5 specimens shall be immersed for 168 hours at 85 ± 3°C in each of the test liquids as indicated in the individual product standard. For certain applications a higher/lower temperature and longer/shorter duration of immersion in a specific test liquid may be required, the same would be specified in individual product standard. Some of the typical test chemicals are indicated below:

a) Distilled water (*see* IS 1070 : 1977)

b) Sea water (*see* IS 9770 : 1978)

c) Toluene (*see* IS 1839 : 1961)

d) Lubricating oil — SAE 40 (*see* IS 4578 : 1968)

e) Transformer oil (*see* IS 335 : 1983)

f) Diesel (*see* IS 1460 : 1974)

g) Ethylene glycol (*see* IS 5295 : 1969)

h) Hydrochloric acid (*see* IS 265 : 1976)

j) Butyl alcohol (*see* IS 361 : 1973)

Immediately upon removal of the test specimens from the test liquids the minimum shear strength shall be determined as per **14.1.2.1** without curing the pin and bush for 24 hours at 27 ± 2°C.

14.3 Shear Strength at Elevated Temperature/Hot Strength

14.3.1 Prepare test specimens as specified in **14.1.1** and **14.1.2**. The specimens shall then be heated to 150 ± 3°C in an oven for 2 hours. Thereafter, the shear strength (**14.1.2.1**) shall be measured within 30 seconds of the removal of the assembly from the oven.

14.4 Shear Strength After Ageing

14.4.1 The pin and bush assemblies shall be prepared as specified in **14.1.1** and **14.1.2**. The assemblies shall then be placed in an oven at 150 ± 3°C for 1 000 hours. Thereafter, the specimens shall be cooled to laboratory temperature for an hour and shear strength (**14.1.2.1**) determined. At least 10 sets of pins and bushes shall be used for this test.

14.5 Shear Strength at Low Temperature

14.5.1 The pin and bush assemblies shall be prepared as specified in **14.1.1** and **14.1.2**. The assemblies shall then be placed in a container having a temperature of −50°C and conditioned at this temperature for 2 hours. Thereafter, the specimens shall be taken out and tested within 30 seconds for shear strength (**14.1.2.1**).

15 SEALING CAPABILITY

15.0 General

This test method covers determination of sealing capability that is pressure resistance capacity of adhesives in thread sealing and gasket sealing under the defined conditions of preparation, conditioning and testing. Two procedures have been covered. Either of the two methods should be selected for determination, as agreed to between the manufacturer and purchaser. The method used shall be declared in the report.

15.1 Preparation of Specimens for Checking Thread Sealing Compounds

A manifold as per Fig 3 made out of solid steel square bar with the following dimensions 40 × 40 mm square and 150 mm long shall be taken for the test. On this bar, three through holes are drilled on the long face and they shall be threaded with pipe thread $R_p 1\frac{1}{2}$ as per IS 554 : 1985. Thus there are six threaded holes in total that are to be plugged. A suitable threaded plug with hexagonal head to match the above shall be machined and checked for its free movement in the manifold. On the centre of the square bar a hole shall drilled to meet the end of the three holes. Through this hole matching coupling threads shall be machined to suit the hose connection from a hydraulic pump (either hand operated or electrically operated may be used for the purpose of building pressure inside the manifold). The steel of manifold shall be capable of withstanding corrosion.

15.2 Preparation of Specimens for Checking Gasket Sealing Compound

A set of raised face flanges as shown in Fig 3 is machined out of steel conforming to IS 226 : 1975 with provisions for connecting a pressure gauge and coupling to connect to the hydraulic pump. The flange shall have six bolt holes for tightening. The bolts shall be of M12 size and capable of withstanding a tightening load of 2.8 to 3.0 Newton metre [*see* IS 1364 (Part 1) : 1983].

15.3 Determination of Pressure Resistance

15.3.1 *Method A*

The thread sealing compound is applied to half the periphery of the second and third thread of the hexagonal head plugs and tightened to the manifold with the use of a wrench to a load of 2.5 to 3.0 Newton metre. The manifold is then allowed to stand at a temperature of 27 ± 2°C for 24 hours before being connected to the hydraulic pump.

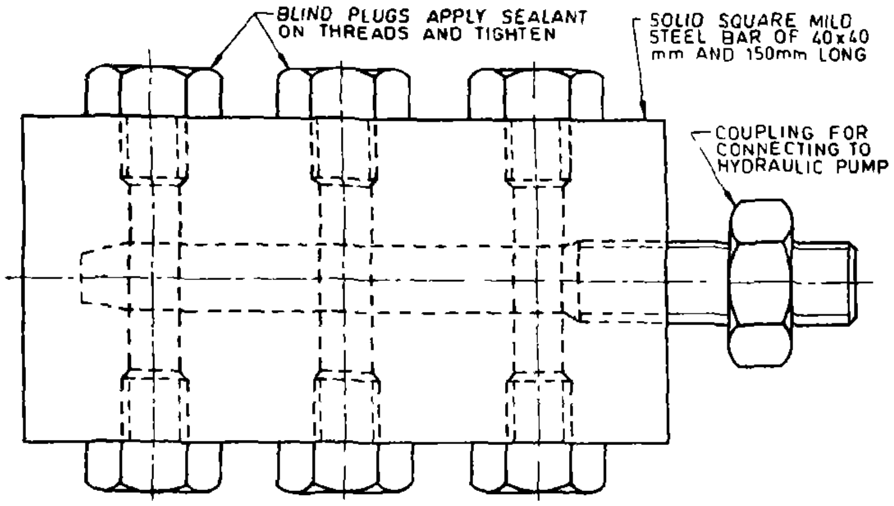

BLIND PLUGS APPLY SEALANT ON THREADS AND TIGHTEN
SOLID SQUARE MILD STEEL BAR OF 40x40 mm AND 150mm LONG
COUPLING FOR CONNECTING TO HYDRAULIC PUMP

FIG. 3 MANIFOLD FOR HYDRAULIC TESTING

In the case of gasketing compound, it is applied on one of the raised face flange as a uniform bead of diameter 3 mm and the mating flange placed above, taking care that the flanges do not move and then tightened The M12 bolts and nuts should be tightened to a torque of 2·8 ± 0·1 Newton metre. Here again care should be taken that all the bolts are uniformly tightened by adopting the technique of tightening opposite bolts in sequence. Five such sets of flanges shall be used for testing each batch of gasketing compounds. The flanges shall be allowed to stand at a temperature of 27 ± 2°C for 24 hours before being connected to the hydraulic pump.

The hydraulic pump should be pressurised uniformly throughout the period of testing at a constant rate of 10 MPa per 10 minutes. Continuous observation for leaks may be made while increasing the pressure gradually at an interval of every 10 minutes, holding the pressure for 5 minutes after every increase

The test is carried till the test specimens start leaking and the pressure at the point of leak is recorded. However, the tests shall not be carried beyond a maximum pressure of 400 MPa even if the specimens do not show any signs of leak.

15.3.2 *Method B*

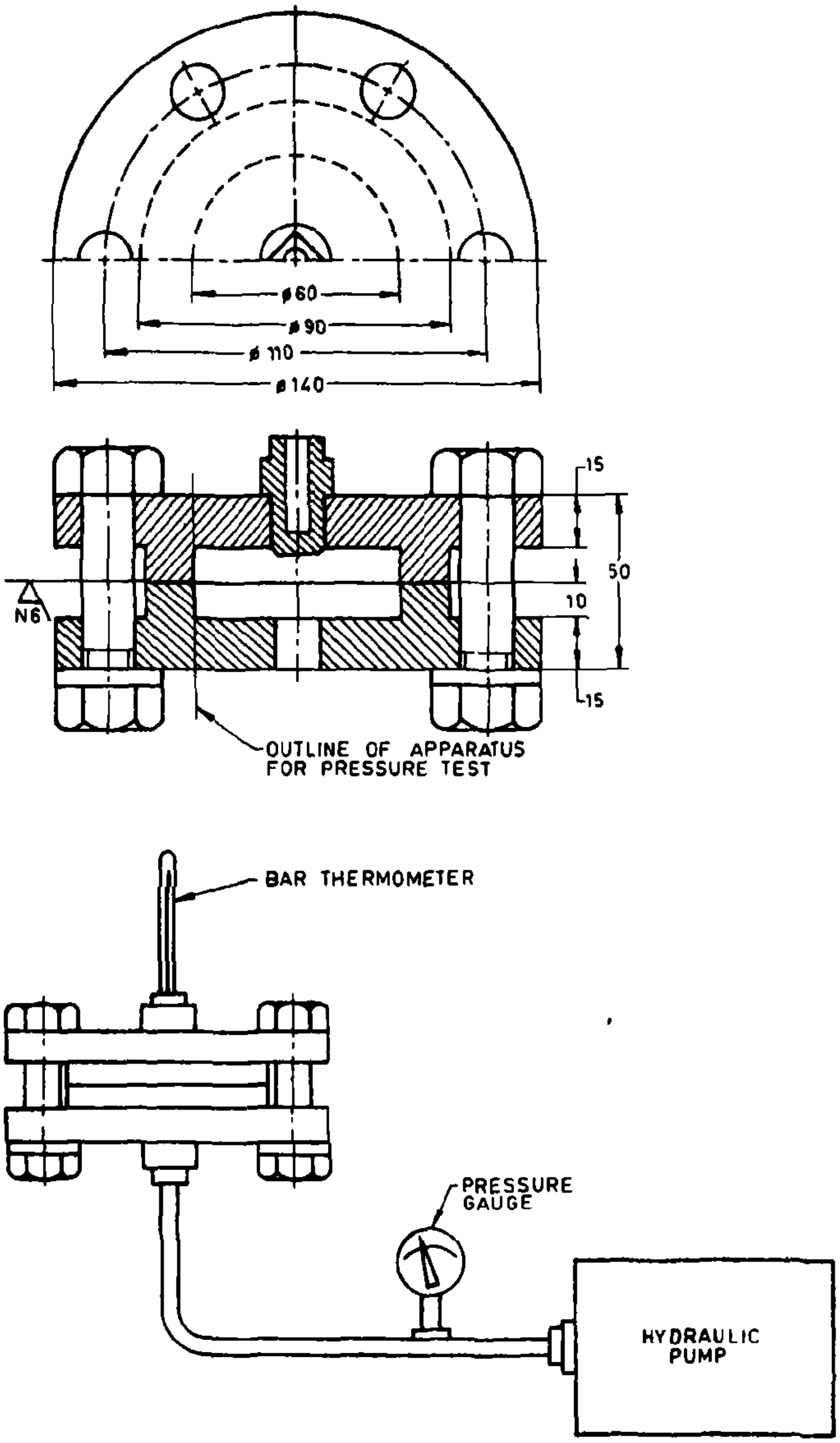
Alternatively, the compound can also be tested immediately after the application on the manifold or flange by connecting it to the hydraulic pump. The pressure at which the joint leaks is recorded. Similarly after 1 hour curing (i e. after a lapse of 60 minutes from the time of tightening), once again the pump is pressurized to see the point of leak and the pressure recorded A third reading at the end of 24 hours curing may similarly be done and leaking pressure recorded. The pressure withstanding capability is recorded in MPa after the prescribed time in minutes or hour

This means report the pressure resistance reading along with time for which it is checked.

15.4 Methods of Testing Gasketing Compound at Elevated/Low Temperature

The gasket compound is applied in accordance with **15.3** on the raised face flange and allowed to cure for 24 hours at a temperature of 27 ± 2°C. Thereafter, the flange is connected to a 500 mm long steel pipe with suitable couplings. At the end of the steel pipe, connect the hydraulic hose and the pump The steel pipe and flange are then kept in a suitable enclosure capable of being maintained at a temperature of 250 ± 1°C. The temperature of the enclosure is slowly raised to the desired temperature as agreed to between the purchaser and the manufacturer for testing gasketing compound at elevated temperature. The pressure in the flange is then increased gradually with the help of the hydraulic pump. The pressure is held for a few minutes at intervals of 10 MPa to see if the frange leaks from the droping gauge pressure. If no leak is observed till 50 percent of the full pressure test (at room temperature) then the sealant is said to have passed the high temperature test. Sufficient care should be taken to release the pressure immediately in case of danger or leaks

15.4.1 Similarly low temperature test may be carried out by keeping the gasket compound applied flange in a low temperature enclosure capable of being maintained at −50°C. If no leak is observed till 50 percent of the full pressure test at room temperature, the compound is said to have passed the low temperature test.



All dimensions in millimetres.

FIG. 4 FLANGED PRESSURE VESSEL FOR PRESSURE RESISTANCE TEST

ANNEX A

(*Clause* 0.2)

INTENDED USES OF ANAEROBIC ADHESIVES AND SEALANTS

A-0 GENERAL

Anaerobic adhesives are one-part, room temperature hardening compounds, possessing very high strength, basically suitable for parts fitting into one another These are mainly used for thread locking, bearing retaining, sealing and gasketing applications. Anaerobic thread locking adhesives prevent loosening of fasteners in fastened assemblies which are subjected to heavy vibrations, shock and impact loads The strength and viscosity of anaerobic adhesives can be varied independently, to fulfil various end uses. High viscosity grades are recommended for fasteners of higher diameter since gaps to be filled are larger in size and high strength grades are needed for heavy vibration and high tensile fasteners

Information as regards mode of application, area of application, temperature effects, disassembly, reuse of treated parts and precautions to prevent contamination along with polymerization are covered in the following paragraphs

A-1 The compound cures to an infusible, insoluble state by confinement between closely fitting metal surfaces The compounds are intended for use in sealing threaded fasteners, plugs and other threaded fittings against fluid pressure, for locking such threaded assemblies against working loose under shock and vibration and for retaining existing or replacement ball bearings in worn housings, thereby obviating the need for establishing a press fit A low viscosity compound is intended for use in closely fitting joint or for application to the outside of an assembled joint into which the compound is introduced by capillary action The high locking strength compounds are intended for use on high strength assemblies or short engagement areas or where a permanent or semi-permanent joint is required A low strength compound can be used for long threads or on weak metals such as aluminium/brass, etc, where the stronger compound might lock so tightly as to cause the assembly to break on attempted disassembly

A-1.1 Some of the end use applications for Anaerobic compounds covered by this specification are as follows

a) Securing set screws that tend to rotate under vibration

b) Securing studs, particularly where the class 5 interference threads fit may be eliminated or where the class 5 threads fit has been tapped slightly oversize.

c) Housing screws on instruments, electric and electronic equipments.

d) Where it is difficult to obtain locking with mechanical devices and where using the compound is economically advantageous.

e) For adjustment screws, where backlash is not desired or where parts must be positioned with a great deal of accuracy By selection of a proper grade of the compound, varying degrees of holding power can be obtained and a compromise between resistance to vibration and ease of adjustment may also be obtained

f) For smaller sizes of screws, where the sealing compounds will generally be more economical than other locking devices

g) For through-screws, plugs and fittings in fluid filled housings to prevent both loosening and leakage

h) For retaining and sealing ball bearing, oil seals, sleeves, gears, pulleys, sprockets, fans and rotors, to replace a press fit and thereby eliminate distortion and close tolerances, to seal a press fit against leakage under fluid pressure, or in conjunction with a press fit for additional strength and reliability and to eliminate fretting corrosion. Fretting corrosion is a form of damage to the mating surfaces of metal parts which are subject to slight relative motion under load The fretting phenomenon, sometimes called 'wear oxidation' or 'chaffing' often affects tightly clamped parts.

j) To restore the fit of a replacement bearing to a worn housing

k) To retain bearings in aluminium castings, eliminating the need for steel sleeves and avoiding the possibility of splitting the castings

m) To seal hydraulic fittings against loosening and leakage under high pressure fluids, including lubricating oils, fuels, hydraulic fluids.

n) The sealing compounds are NOT to be used in OXYGEN LINES.

p) For filling larger gaps in threaded assemblies generally a highly viscous compound is used, especially one filled with PTFE.

q) Thicker grades are also suggested for gasketing in lieu of traditional gaskets.

r) Gasketing compound eliminates the need for storing various sizes of gaskets in various materials, such as rubber, paper, asbestos, etc. Gasketing compound also takes care of nicks and dents in flanges during the maintenance of the equipment by filling the nicks and dents and sealing effectively.

A-2 TEMPERATURE EFFECTS

A-2.1 Continued satisfactory service of the compound specified herein may be expected within the range of −50°C to 150°C, if the compound passes the heat ageing test and low temperature tests. As for the effect of temperature on speed of curing, the set up time is approximately halved for every 10°C increase and approximately doubled for every 10°C decrease.

A-3 DISASSEMBLY AND REUSE OF TREATED PARTS

A-3.1 When proper grade has been used, treated parts may be disengaged by back-off torquing in excess of the maximum torquing load. The sealant applied parts, which are engaged too tightly, may be softened by the application of heat such as by means of a soldering iron or torch. Disassembled parts should be retreated prior to assembly to achieve the desired results The parts may or may not be cleaned before reassembling

A-3.2 Excess compound spilled during application may be wiped off with a cloth moistened with water or 1.1.1 trichloroethane. However, compound which has set is insoluble and can be removed by wire brushing or in the case of threaded fasteners, running the nut off and on until the old sealant has worn away.

A-4 METHOD OF APPLICATION

A-4.1 Clean parts of the common metals will require no particular surface treatments. Where the metals have had preservative treatment or contain greases or lubricants, the usual degreasing agent such as 1.1.1 trichloroethane can be used Unusually smooth surfaces such as bright nickel or chromium platings should be slightly roughened; or hence relatively weak bonding will result

A-4.2 For application on fasteners, prior to assembly, the surface to be joined should be wetted with the applicable grade of sealing compound by brushing, dipping or tumbling, etc. Where brushing is employed, use of camel-hair brush is recommended. There is no advantage in using more of the compound than what the surface will retain. Except for the very viscous grades, use about 1 millilitre of adhesive to cover 50 to 52 cm^2, area for very viscous grades, use about 1 millilitre of adhesive to cover approximately 20 to 30 cm^2 area.

A-4.3 For application, already assembled fasteners to use of compound directly from the container is recommended. An applicator nozzle can be attached to the container and dispensed directly on the assembled fasteners by touching the dispenser nozzle to the screw thread where it enters the mating part. Adequate filling is assured when a ring of liquid around the screw at one point of entry persists for an hour or more. This ring of liquid acts as a reservoir on which the threaded spaces can draw until fully impregnated, provided displaced air can escape from the opposite end. Where the thread fit is rather loose a second treatment or a viscous grade is recommended.

A-4.4 For faster curing when specified or recommended by the manufacturer, primer or activator shall be used, according to the manufacturer's instructions for primed or activated surfaces only. Use of activator may cause reduction in strength. However use of primer is restricted for passive surfaces like aluminium, chrome plated parts, plastics, etc

A-4.5 Where fasteners are used in small quantity the compound may be applied economically by tumbling Information relative to the best methods for tumbling may be obtained from the manufacturer.

A-5 STORAGE TO PREVENT CONTAMINATION AND POLYMERIZATION

A-5.1 The storage life of the sealant is dependent upon maintaining air over the surface of the compound and upon keeping the compound clean. Therefore, the manufacturer's recommendation relative to storage should be strictly followed In no case parts to be assembled should be dipped into the compound while it is in the storage container, as this will result in severe contamination and destroy the usefulness of the sealant, in a very short time. Also do not pour adhesive compound from one container to another. The air space above the liquid in the container shall not be reduced so as to maintain its specified shelf life.

ANNEX B

(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
226 : 1975	Structural steel (standard quality) (*fifth revision*)
265 : 1976	Hydrochloric acid (*second revision*)
335 : 1983	New insulating oils (*third revision*)
361 : 1973	Normal butyl alcohol, technical (*second revision*)
554 : 1985	Dimensions for pipe threads where pressure tight joints are required on threads (*third revision*)
1070 : 1977	Water for general laboratory use (*second revision*)
1364	Hexagon head bolts, screws and nuts of product grades A and B:
1364 (Part 1) : 1983	Hexagon head bolts (size range M 3 to M 36) (*second revision*)
1364 (Part 2) : 1983	Hexagon screws (size range M 3 to M 36) (*second revision*)
1364 (Part 3) : 1983	Hexagon nuts (size range M 1·6 to M 36) (*second revision*)
1460 : 1974	Diesel fuels (*second revision*)
1839 : 1961	Toluene, reagent grade
4578 : 1968	Lubricating oils for refrigeration machinery
4905 : 1968	Methods for random sampling
5925 : 1965	Ethylene glycol (*first revision*)
9770 : 1978	Artificial sea water for laboratory use

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations Enquires relating to copyright be addressed to the Director (Publications), BIS

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition Comments on this Indian Standard may be sent to BIS giving the following reference :

Doc : No. PCD 15 (829)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices:	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	331 01 31 331 13 75
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola CALCUTTA 700054	37 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	53 38 43
Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113	235 02 16
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093	6 32 92 95

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE
FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR.
PATNA. SRINAGAR. THIRUVANANTHAPURAM.

Printed at Printrade, New Delhi, India